

Lab of the Year Submission 2004

H O V I O N E
LOY04

TECHNOLOGY
TRANSFER
CENTER

East Windsor, New Jersey



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WHO

Hovione is a fine chemicals company specializing in the process development and manufacture of active pharmaceutical ingredients (APIs) and regulated intermediates. Expert in complex process chemistry, Hovione is an international family-owned company headquartered in Loures, Portugal, with manufacturing facilities in Portugal and China. Hovione serves global companies in the biotech and pharmaceutical industries, the U.S. being its largest market.



WHO

W H Y

S Y M B O L C O M M I T M E N T S H O W C A S E

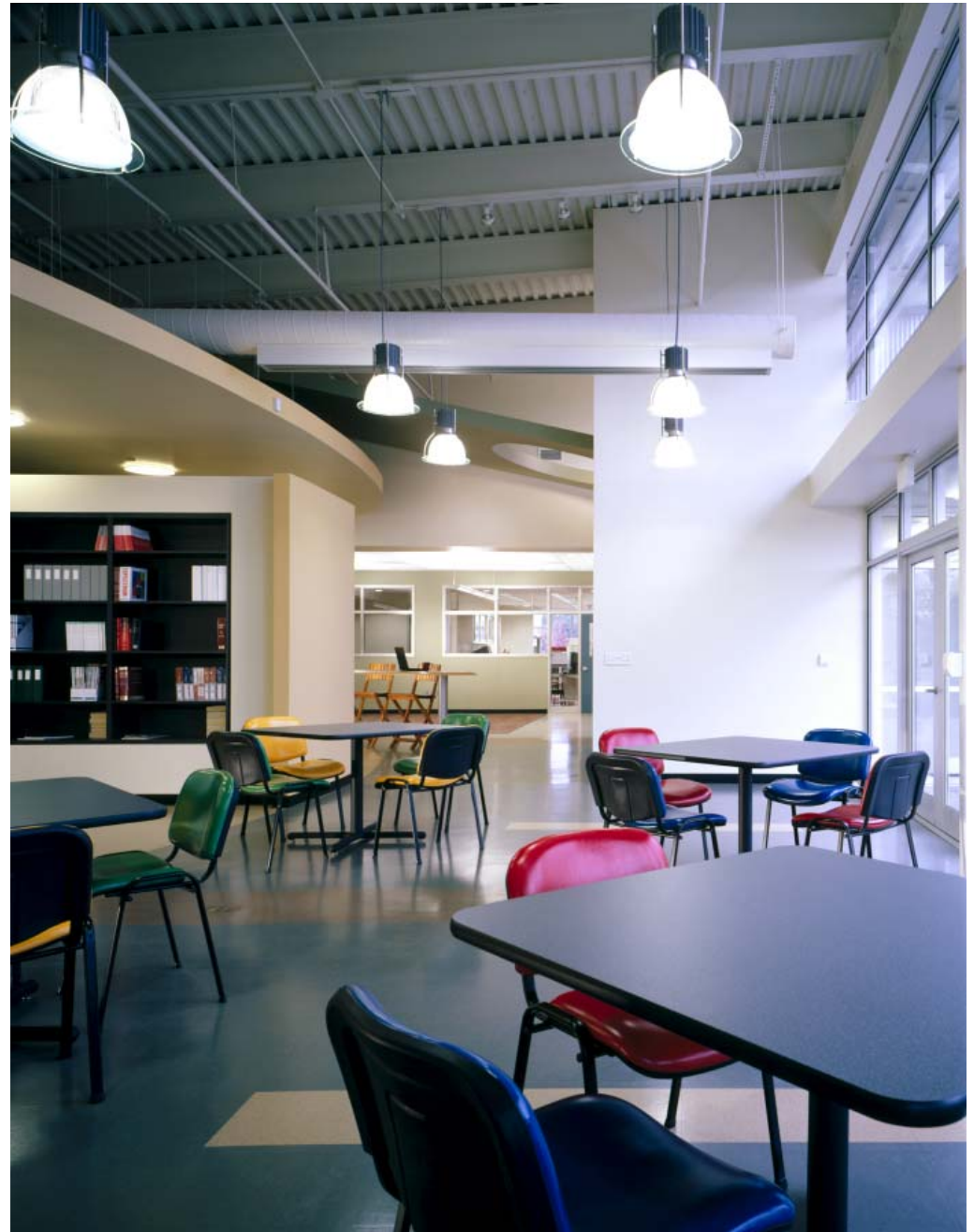
WHAT

WHEN

WHERE

WHY

Hovione's new **Technology Transfer Center** located in East Windsor, NJ, provides chemical synthesis and product development for implementation in their manufacturing facilities overseas. The facility was constructed on a **fast-track schedule**, and was completed in September of 2002. The TTC is **relatively small**—23,650 square feet—yet it **contains all the elements of a larger facility**, including executive and administrative offices, formal and informal meeting areas, and development and scale-up laboratories. Each type of space is independently expandable, without disturbing current operations. The first phase of expansion is planned to enlarge the facility to approximately 33,000 square feet.



multi-purpose community space

THE DESIGN OF THE TTC IS PREDICATED ON THREE MAJOR GOALS:



1

To be a symbol of the quality, integrity, and value Hovione provides its US customers



2

To be an attractive and inspiring work environment in keeping with Hovione's commitment to its employees



3

To act as a showcase for the functional and technological approach Hovione brings to its work

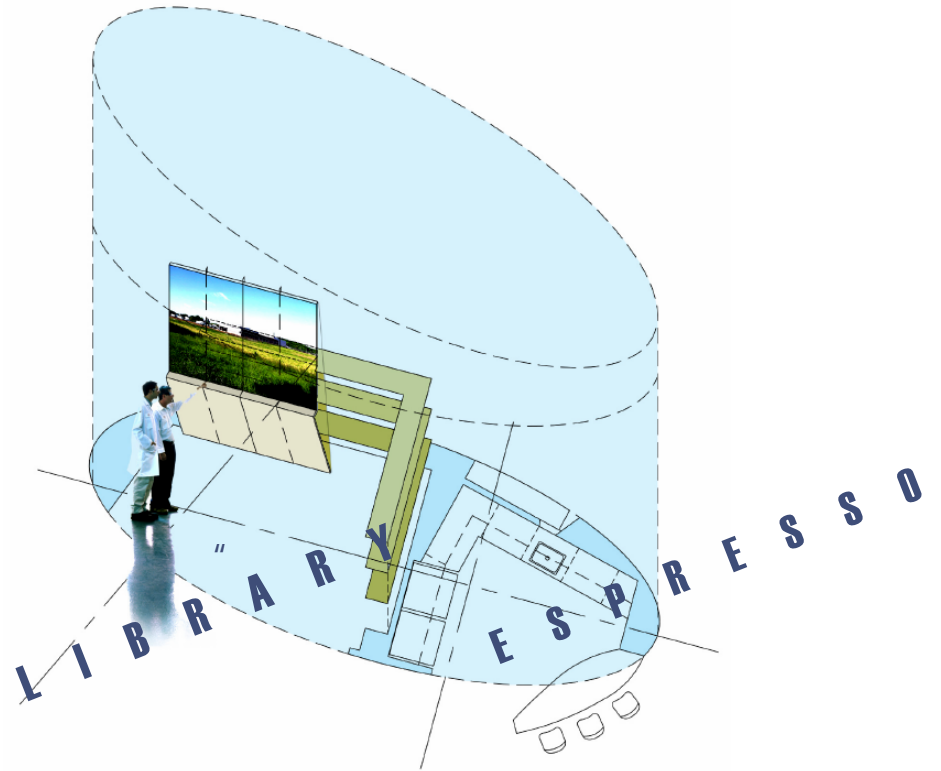
WHY

1 A symbol of the quality, integrity, and value Hovione provides its US customers:

Clad in glass and metal, and articulated with a soft green fascia that refers back to Hovione's Portuguese roots, the building projects a **high-tech image**, while maintaining a **warm appearance** to visitors and employees alike. Just as the floor plan creates a distinction between the functions in the building, the massing of the exterior clearly articulates what is going on inside the building. The multiple transparent planes of glass, starting from the exterior and carrying on through the office and lab spaces, offer **glimpses of activity within**, welcoming visitors to the new facility.

"The TTC is a significant investment that clearly demonstrates our **commitment** to our North American customers, extending our capabilities on a global scale. Further, the design of the facility reflects our culture and that of our clients by creating an attractive environment for our employees that allows them to be extremely effective in their work."

Guy Villax
CEO of Hovione
Member of the Board



WHY

2 An attractive and inspiring work environment in keeping with Hovione's commitment to its employees:

Much of the office space consists of open workstations with low panels to enhance visual **communication** and to **connect** individual workstations to the larger airy volume. Even the enclosed offices have floor-to-ceiling glass on the interior wall, creating **a sense of openness** and allowing natural light into adjacent spaces. Hanging on office walls are black and white photographs of Hovione's specialized chemical processes, which highlight their **technical excellence**.

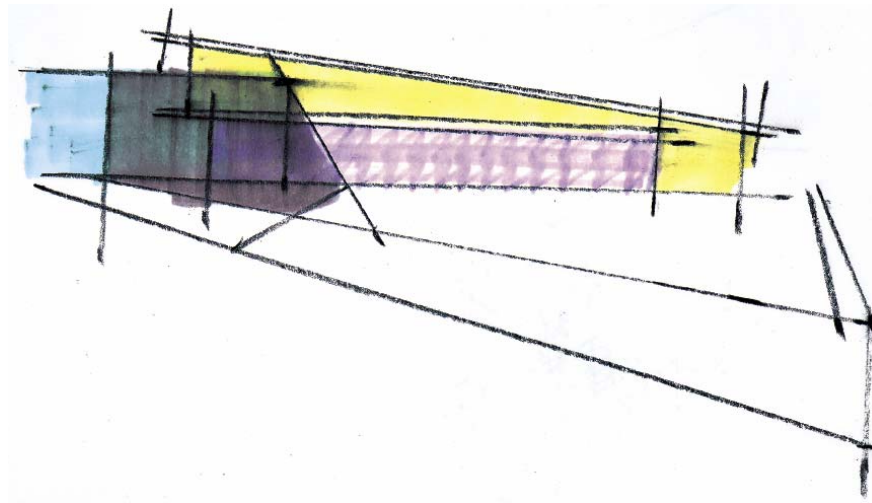
An obvious focal point is the two-story glass meeting area at the center of the building. This light-filled, multi-functional space – the space serves as a library and lunchroom – discreetly separates administrative functions from laboratory functions without forming a barrier to interaction. In fact, locating a pantry, (complete with an espresso bar), and copy area adjacent to this room **encourages interaction** between research, marketing, and technical staff. Photographs of Hovione's facilities in Portugal and China adorn the walls of these shared spaces, and help to **connect the TTC to the global operation**.

Warm colors help create a **consistent and comfortable** ambiance, a far cry from the antiseptic environments typically found in labs. The green used on the exterior fascia – a color employed on all Hovione buildings worldwide – subtly emerges in the interior, becoming the solid portions of the glass wall separating the development labs from office areas. Vinyl tile in multiple colors creates an intricate pattern that reflects building attributes such as column spacing, lab modules, and circulation paths. Complimentarily colored carpet tiles are configured as "throw rugs" to further articulate the open workstations.

WHY

3 A showcase of the functional and technological approach Hovione brings to its work:

The TTC offers US-based biotech and pharmaceutical clients process development and scale-up services enabling Hovione to produce small quantities of new chemical entities to support pre-clinical and early-phase clinical development. Through the new TTC, Hovione can now **demonstrate processes** locally before transferring them to manufacturing plants for implementation. The **technical capabilities** of the TTC facility mirror those of Hovione's commercial production facilities, ensuring the seamless and cost-efficient **transfer of processes** between North America and manufacturing plants in Portugal and Macau.



“The amount of natural light and the quality of the artificial light makes these labs great places to work. The visual connection between the labs and offices really enhances communications and facilitates interaction. This, along with the arrangement of hoods and the location of support equipment allows us to multi-task and to maximize our efficiency.”

Scott A. Miller
Director of Technology
Hovione

WHO

WHY

WHAT

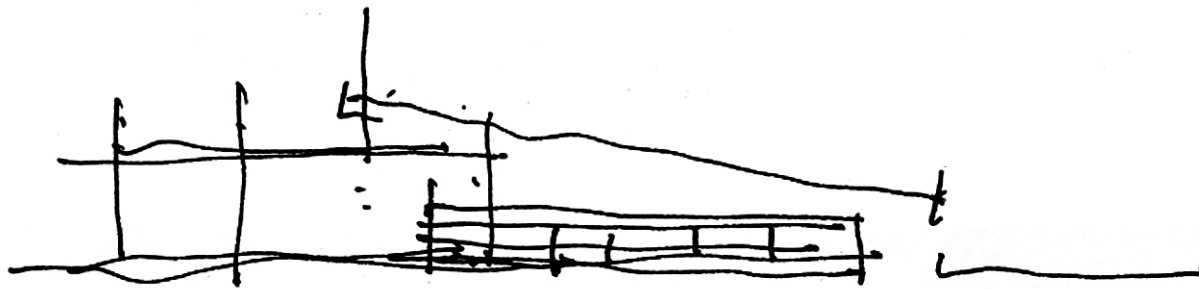
TECHNOLOGY TRANSFER CENTER

WHEN

WHERE

WHAT T E C H N O L O G Y T R

To further serve its North American market, Hovione commissioned the design and construction of a Technology Transfer Center (TTC) in East Windsor, NJ. This facility establishes Hovione's physical presence in the US, close to important clients in the biotech and pharmaceutical industries. The TTC showcases a variety of advanced technologies, and extends Hovione's capabilities as a fully integrated developer and compliant manufacturer of APIs to the global market.

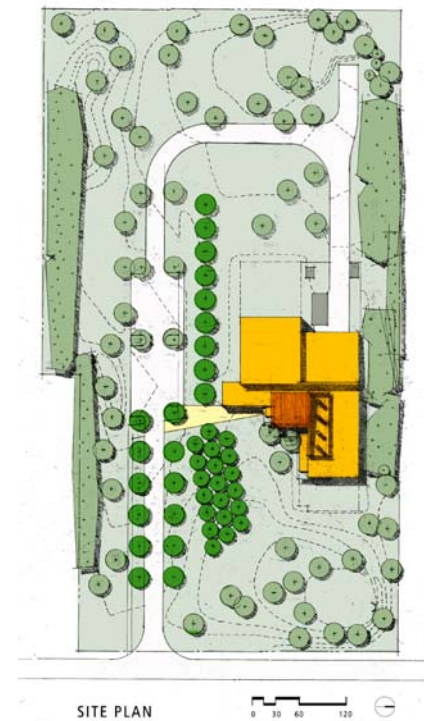


Hovione's Technology Transfer Center bridges the gap from discovery research to manufacturing. The new facility tests and optimizes chemical syntheses and conducts chemistry through to the pilot-plant scale, ultimately grooming the chemical process for manufacture overseas.

A N S F E R C E N T E R

Hovione chose a site in New Jersey, close to many of their US customers, that is easily accessible by car, train, and plane. The Technology Transfer Center sits comfortably on a greenfield site surrounded by residential development as well as light industrial facilities although the site is predominately rural in nature.

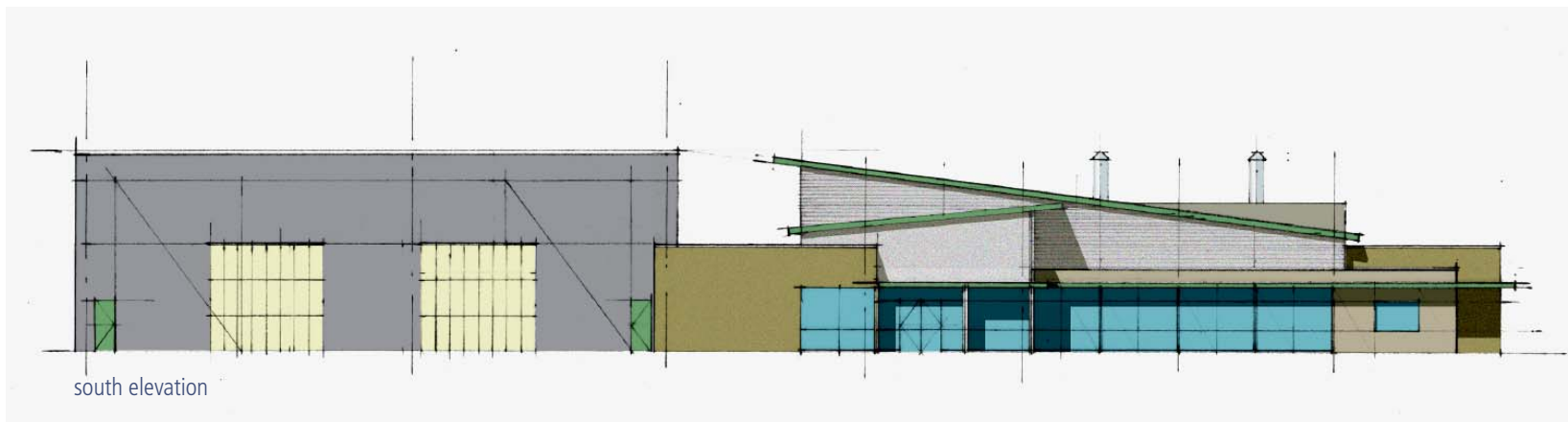
By gently sloping the site in two locations, the detention basins are seamlessly woven into the natural landscape. A single story facility, it is organized around a south facing courtyard, providing maximum daylight within.



WHAT

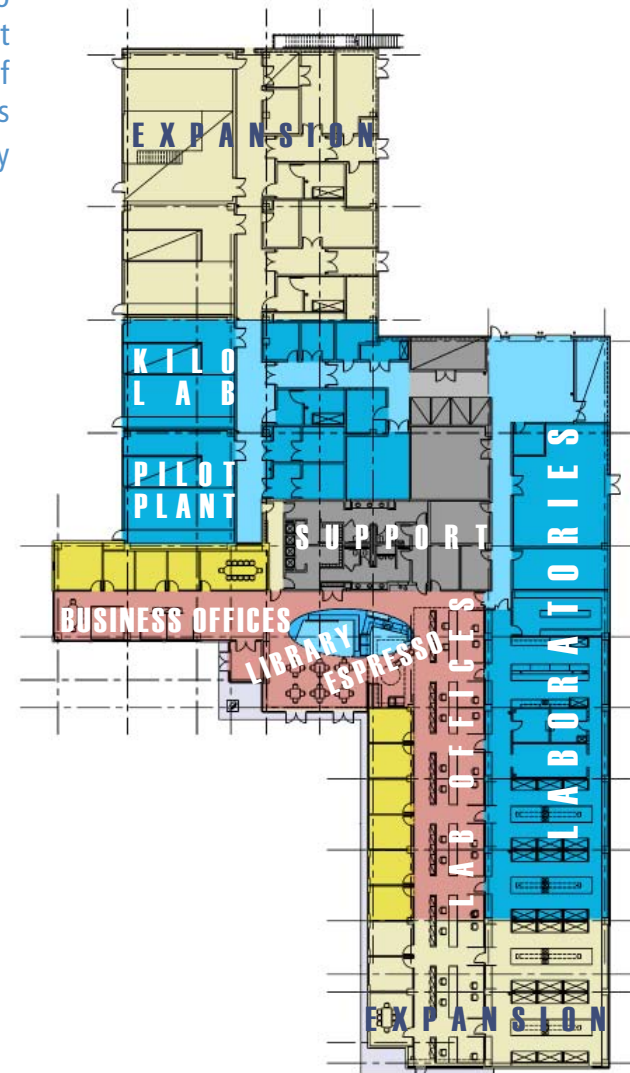
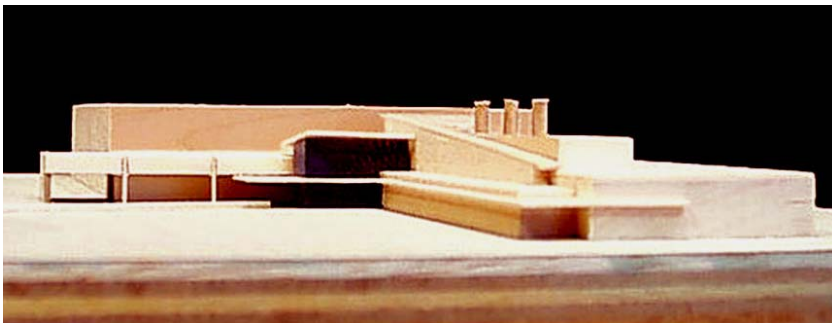
T E C H N O L O G Y T R

The massing of the facility springs directly from the functions it houses. The lower areas house offices, interaction areas, and development labs. The higher portion encloses the cGMP process plant. The varying roof line, combined with the interplay of glass and soft green and taupe metal panels articulates the façade. The entrance through the courtyard offers a peek of the European style that defines the company.



A N S F E R C E N T E R

The building configuration directly relates to the functional requirements of the scientists' work, carefully addressing personnel and materials flow. The facility is zoned to separate administration, office, and non-GMP lab space from each other as well as from the cGMP scale-up and pilot spaces. Overlaid on this plan is strategic placement of support spaces to foster interaction and optimize materials supply. Even with this segregation, the abundant use of glass in the building helps to unify all spaces, giving most spaces the benefit of natural light and views to the outside. The arrangement of functions in the building serves both the **safety** of Hovione's employees and guests and the **processes** conducted by Hovione's researchers. Together, they are critical factors in the design of the TTC.



WHAT

P R O C E S S E S

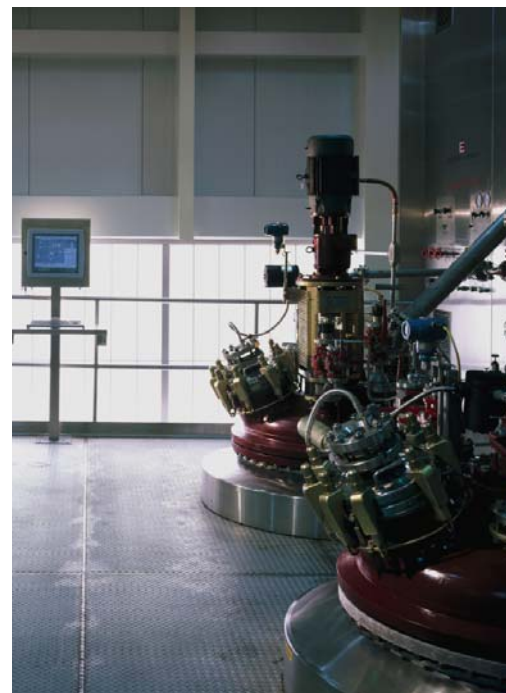
Hovione's Technology Transfer Center bridges the gap from research to manufacturing. The new facility tests and optimizes chemical syntheses and conducts chemistry through to the pilot plant scale, ultimately grooming the chemical process for manufacture overseas.

Operations in scale-up laboratories differ from research laboratories because they perform chemistry at a larger scale to evolve and verify new processes. The work requires larger amounts of chemicals, (requiring safe storage), that produce larger amounts of chemical waste (requiring safe disposal). The equipment itself, is also larger in size.

Laboratory layouts differ from other labs because of the scale-up function, as well. Scaling-up requires more walk-in fume hoods and process modules to house reactors. Also, these laboratories demand extra utilities for process support, and special facilities for supplying and removing chemicals.



kilo lab



pilot plant

PILOT PLANT

cGMP LAB

PRODUCT FINISHING

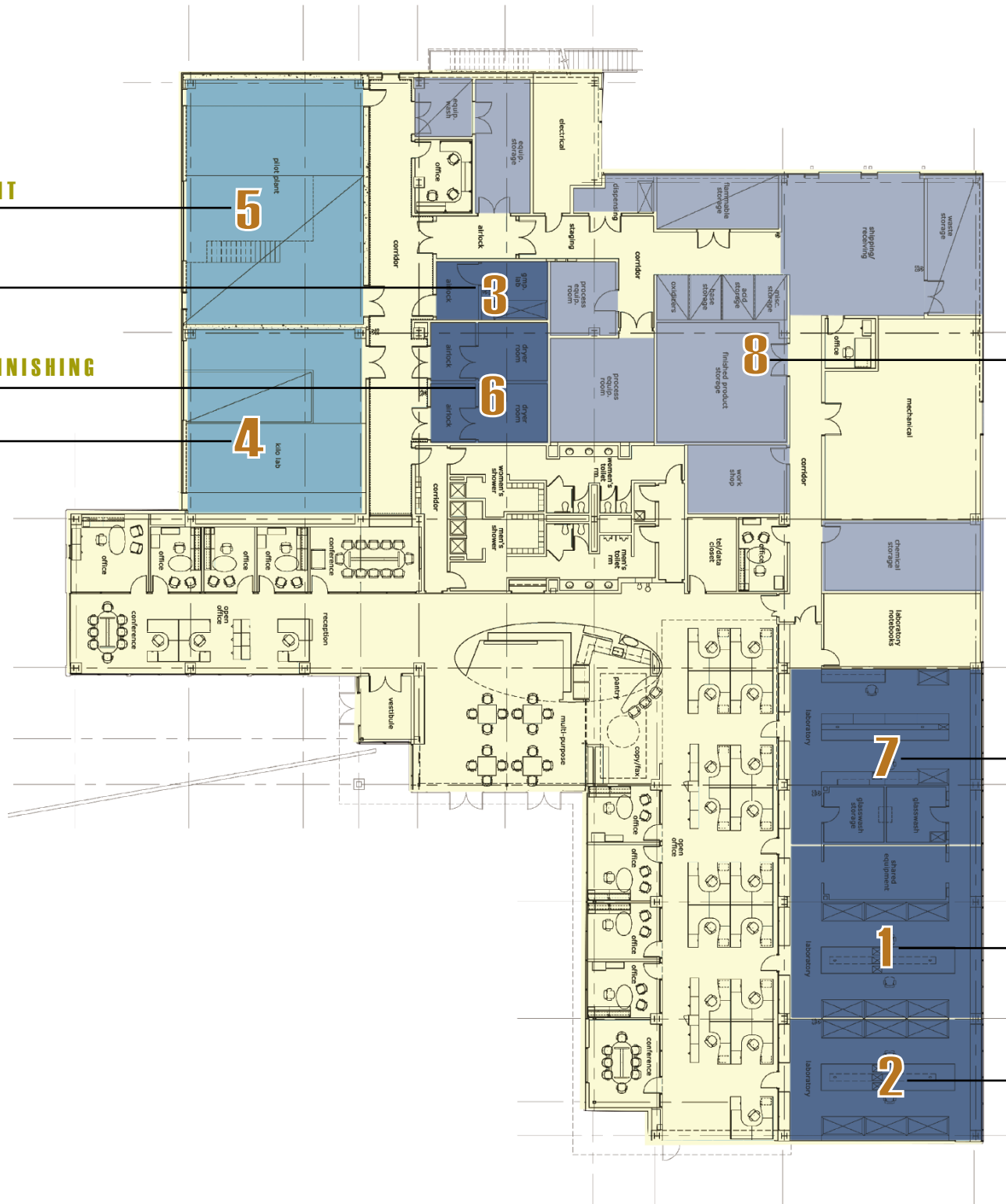
KILO LAB

PROCESS SUPPORT

QC LAB

BENCH SCALE LAB

FIRST SCALE-UP LAB

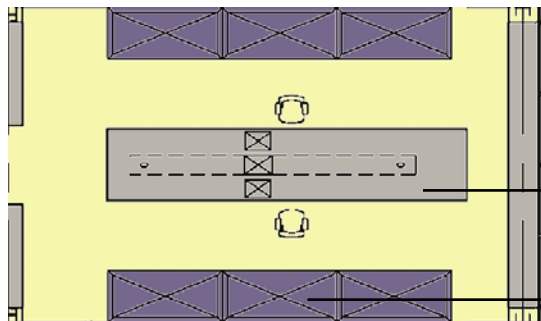
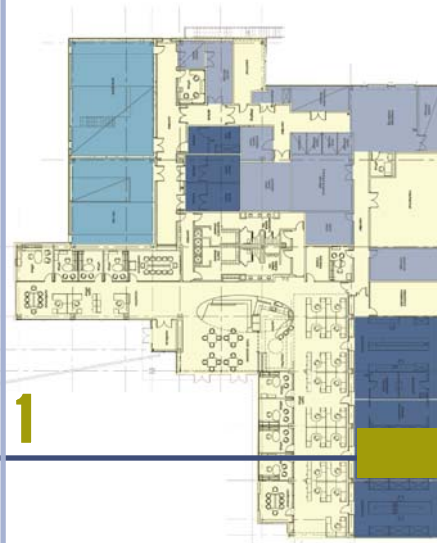


WHAT

P R O C E S S E S

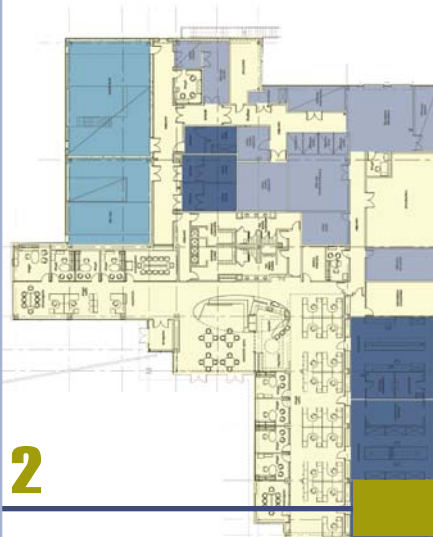
1 BENCH SCALE LABORATORY

- Verify existing process
- Enable research on new processes
- Assure new process reproducibility

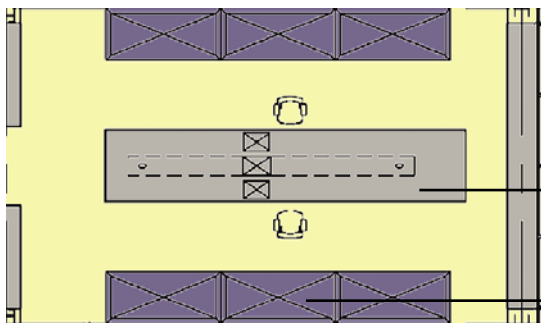


2 FIRST LAB SCALE - UP

- Scale-up new processes
- Verify existing process
- Enable research on new processes
- Assure new process reproducibility



2



INSTRUMENT AND BENCH SPACE

WALK-IN FUME HOODS



WHAT

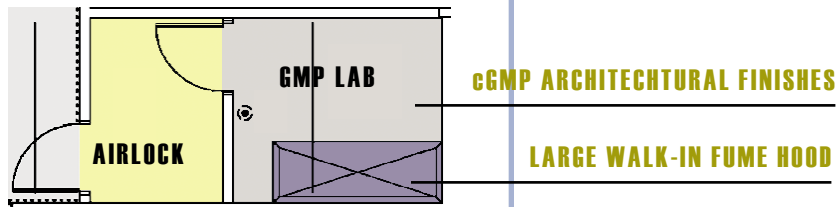
P R O C E S S E S

3 c G M P L A B

- Creates small amounts of drug candidate for first in-man studies
- Configured by design and operations to conform to cGMP procedures
- Endowed with process water, classified air, and other validated utilities



3



4 KILO LAB SCALE-UP

- Scale-up for first pilot studies
- Prepares drug candidate for more extensive first in-man studies
- Creates toxicology supplies
- Configured by design and operations to conform to cGMP procedures
- Endowed with process water, classified air, and other validated utilities
- Includes pressure-resistant construction for explosion deflection and venting
- Provides external tank for collection of process waste

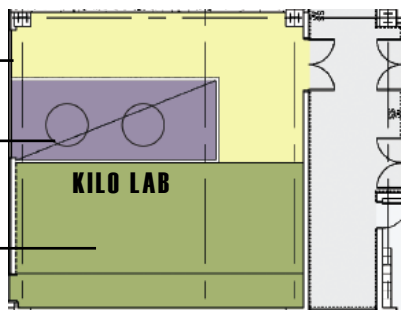


4

EXPLOSION RELIEF PANELS

200 LITER REACTORS

SUPPORT EQUIPMENT



WHAT

P R O C E S S S

5 PILOT PLANT SCALE-UP

- Creates clinical materials to early Phase 2 requirements
- Creates toxicology supplies
- Provides process information for NDA filing
- Configured by design and operations to conform to cGMP procedures
- Endowed with process water, classified air and other validated utilities
- Includes pressure-resistant construction for explosion deflection and venting
- Has external tank for collection of process waste



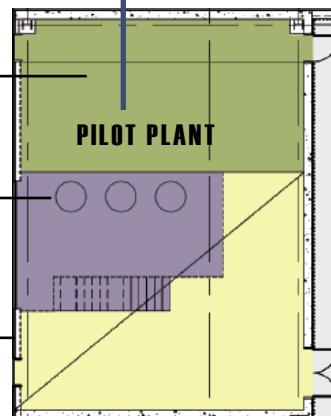
5

SUPPORT EQUIPMENT

PILOT PLANT

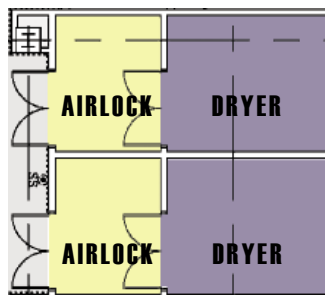
200 LITER REACTORS

EXPLOSION RELIEF PANELS



6 PRODUCT FINISHING

- Two dryer rooms for cGMP handling of drug candidate
- Includes secure finished product storage



cGMP ARCHITECTURAL FINISHES

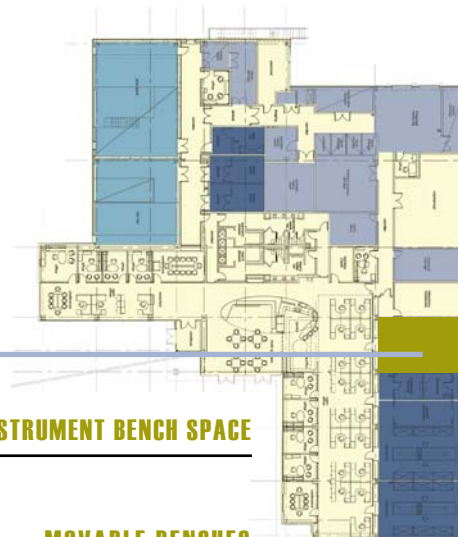


WHAT

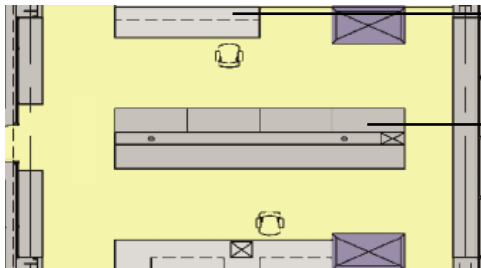
P R O C E S S E S

7 Q C L A B

- Assures proper conduct of process chemistry
- Analyzes and characterizes product quality



7



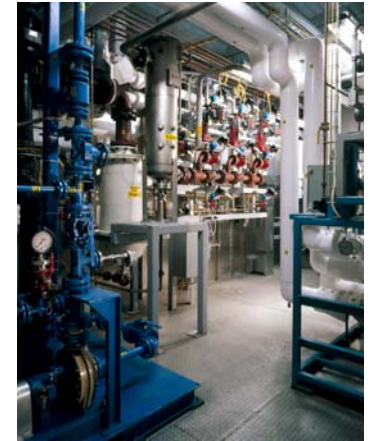
INSTRUMENT BENCH SPACE

MOVABLE BENCHES



8 PROCESS SUPPORT

- Process equipment storage and cleaning
- Chemical storage and dispensing
- Waste storage including sump for process fluid waste
- Workshop for equipment modification and repair



8



chemical storage

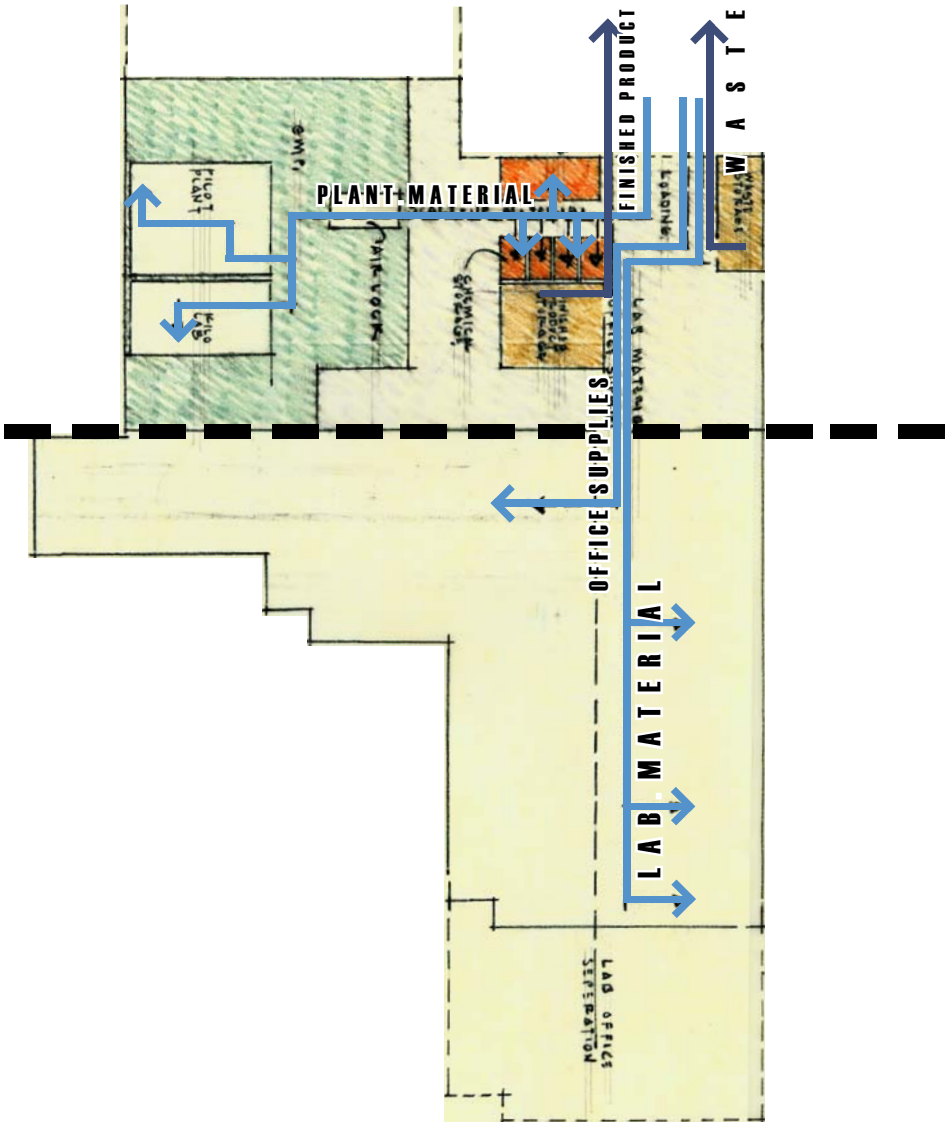
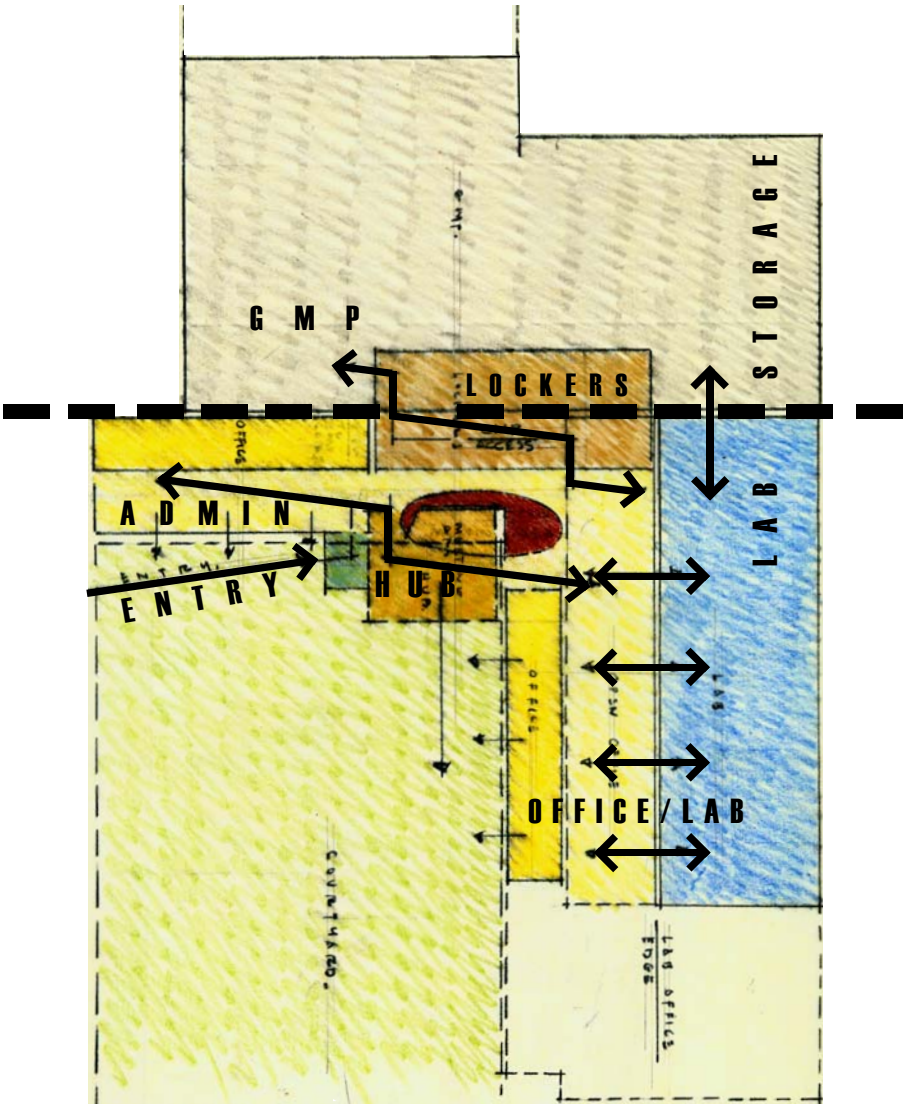
WHAT

S A F E T Y

Safety was paramount in the design and detailing of the TTC. The facility is situated on the site such that the most hazardous processes are **farthest from neighboring properties**. Internally, the layout **minimizes exposure** of personnel to hazards, especially non-research staff. Offices are located away from the labs, but the openness of the facility provides community-enhancing connectivity for all staff. Personnel, chemicals and materials, and equipment flows are arranged for safety and efficiency of operation as well as cGMP control.



PERSONNEL FLOW



MATERIAL FLOW

WHAT

S A F E T Y



PERSONAL AND FIRE SAFETY

- Breathing air apparatus
- Fume hood fire suppression
- Foam fire suppression system



PRESSURE-RESISTANT CONSTRUCTION

- Kilo Lab and Pilot Plant are enclosed on three sides with a four-hour concrete fire wall
- Exterior wall is constructed of pressure-relief panels oriented away from neighboring properties



CHEMICAL CONTAINMENT

- Gently sloped floor to assure containment of contents from largest process vessel
- Overflow stand pipe directs contaminated fire water to on-site underground storage tank (pumped out in accordance with proper handling of hazardous waste)
- Bulk solvents stored in and dispensed from rooms with pressure-venting walls and fire suppression
- Chemical waste storage with dedicated fire suppression located adjacent to loading dock, away from main personnel traffic



WHO

WHY

WHAT

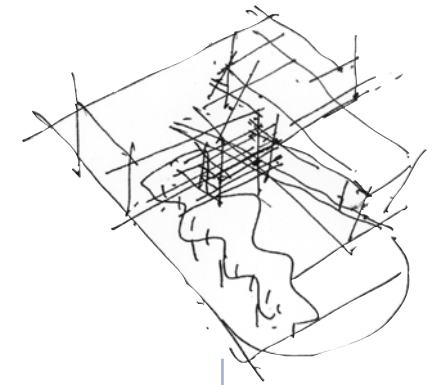
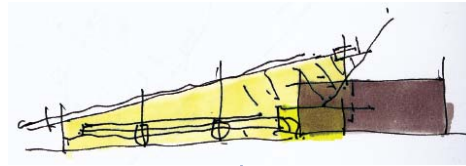
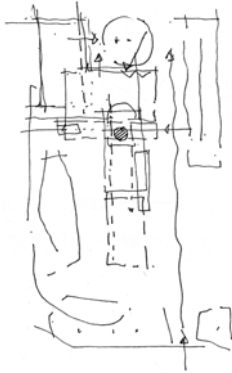
W H E N

A S Q U I C K L Y A S P O S S I B L E

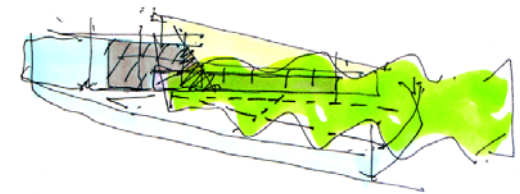
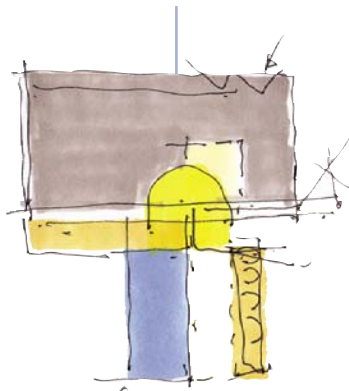
WHERE

WHEN

D **C** **O** **E** **N** **S** **S** **T** **I** **R**



FORM PROJECT TEAM ■ BEGIN ENGINEERING KILO LAB AND PILOT PLANT ■ SELECT COST ■ COMPLETE DESIGN AND ENGINEERING OF KILO LAB AND PILOT PLANT ■ BEING FABRICATED OFF-SITE ■ FINALIZE COST ESTIMATE ■ KILO LAB AND PILOT PLANT



U G C T I O N



SITE ■ IDENTIFY BUSINESS CULTURE ■ FINALIZE SPACE REQUIREMENTS ■ ESTIMATE
PLANT ■ PREPARE CONSTRUCTION ■ TAKE ACTUAL MEASUREMENTS OF PLANTS
PLANT INSTALLED ■ BUILDING ENCLOSED ■ GRAND OPENING ■ FUTURE EXPANSION



WHEN

Hovione required that the TTC be fully operational as quickly as possible. Even before the eight-acre site was selected, the project team was assembled. **The sophisticated process equipment that would occupy more than a third of the building, and which would showcase Hovione's technical capabilities, drove many building requirements.** First on-board the design team was Engineered Technologies Corporation (ETC). ETC was responsible for designing and manufacturing the SmartPlant and SmartLab process modules installed in the TTC. This equipment is critical to Hovione's operations, and thus also critical to the design of the building. The architectural and engineering firm, CUH2A, and the Construction Manager, the Turner Construction Company, were selected next to assist Hovione in selecting a site, and ultimately to design and build the TTC.



“ I wanted to work with people who were as **passionate** about their work as I am about mine, and who thoroughly understood our **need for speed**, quality and cost control. This building is, after all, Hovione's best way to showcase its capabilities to the U.S. market and represents a huge investment for a company of our size. ”

David Hoffman, Hovione U.S. President

While ETC was completing engineering and drawings of the Pilot Plant and Kilo Lab modules, CUH2A and Turner were assisting Hovione with selecting and qualifying sites for the Technology Transfer Center. CUH2A was concurrently **finalizing the space program for the building**. This included the design team visiting Hovione's operations in Portugal **to better understand the company's European business culture**.



Tight clearances and precise connections could be coordinated because fabrication of the **plant modules** was well **underway while the TTC was being built**, and thus the team could make actual measurements at ETC's manufacturing facility. Some interior surfaces that would be inaccessible after the ETC equipment was installed were even painted while the rooms were still open to the elements.

Cost control was an important issue, and everyone on the team worked to value engineer the design and to look for **cost saving opportunities even into the construction phase**. In fact, the original budget only changed due to minor scope increases that were carefully evaluated during the construction process.

WHEN

Both the **pilot plant and kilo lab modules** were prefabricated by ETC in Rhode Island concurrent with the construction of the building, and **delivered to the site on a series of flat bed trucks**. The exterior wall of the spaces housing the ETC equipment was omitted during construction, allowing all the units to slide into place. This required intense coordination between the designers and construction manager to insure that concrete pits, service connections and other building elements were appropriately located and accessible for final connections. **The exterior wall and the finished floors were completed after the modules were installed.** All the necessary utilities were provided along the inside of the concrete corridor wall, where they were connected to their corresponding lines of the modular pilot plant and kilo lab. (The individual mechanical systems—also provided by ETC—are housed in adjacent rooms.)



“ ETC’s method of plant delivery provides for the maximum separation of concerns between building elements and process systems. This accelerates program development, **minimizing** coordination **costs** and time during design, construction, and commissioning. ”

Don Hall President, ETC



“ Often people think of modules for simple skids, like chillers or vacuum systems. Here, Hovione took the **modular concept to a new level** and incorporated all the components, even the motor controls, to make a **fully functioning process plant**. I was incredibly impressed by the level of detail that was included and by the quality of the finishes, and all for a comparatively low cost. ”

Stephen M. Hall, PE
Specialist in API plant design
Director of Process Technology
AMEC Americas



WHO

WHY

WHAT

WHEN

WHERE

E P I C E N T E R

WHERE

Hovione's Technology Transfer Center is located in East Windsor, New Jersey—near Princeton—the epicenter of the pharmaceuticals industry. Biotech, pharmaceutical, and emerging technology companies continue to locate in the region as the State of New Jersey actively promotes its commitment to the high-tech industry. The location is ideal because of its accessibility to New York City, as well as to Philadelphia. Also, the proximity to two international airports, Newark and Philadelphia, and quick access to the NJ Turnpike/Interstate 95 are critical to an international company like Hovione. The eight-acre site selected by Hovione serves as the headquarters for Hovione's US operations and allows the building to grow up to three times its current size.

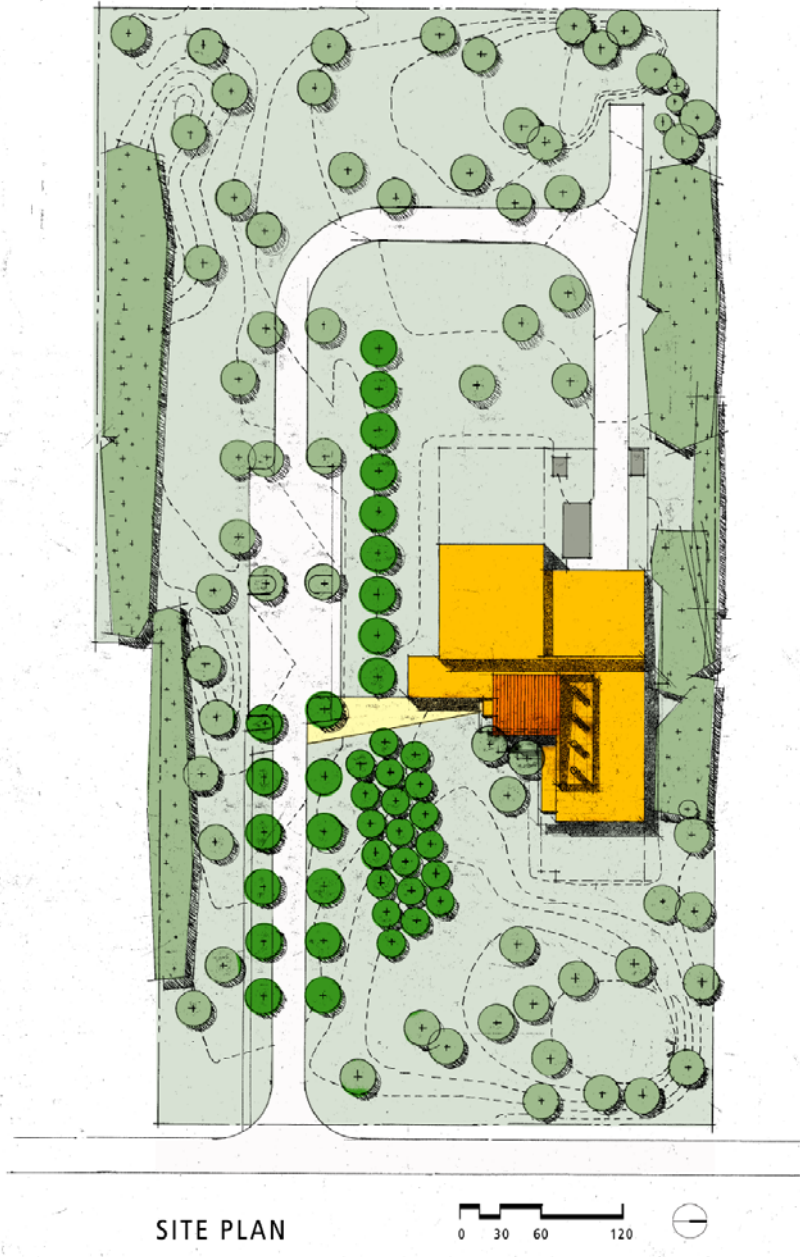


“Hovione’s very attractive new building and state-of-the-art lab space is an **exciting addition** to a growing list of pharmaceutical research firms in our community. The presence of Hovione’s research and development headquarters in East Windsor will help to **attract** other high-tech firms and **stimulate future growth** and development, especially in the pharmaceutical area.”

Janice S. Mironov
Mayor
East Windsor Township, NJ

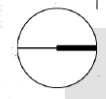
APPENDIX

S I T E P L A N S



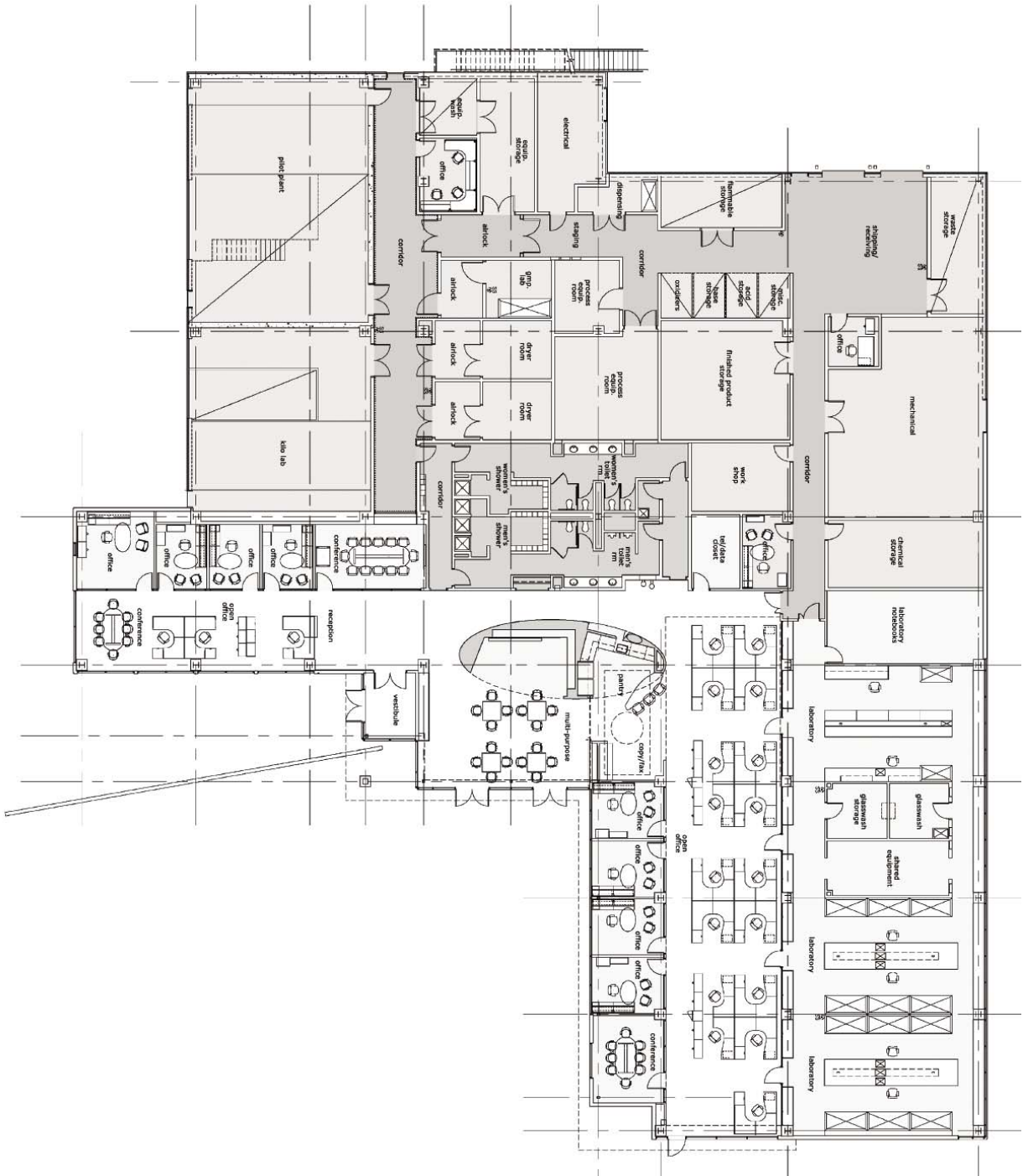


CONTEXT PLAN



APPENDIX

F L O O R P L A N



L O Y O 4
SUBMISSION PRESENTED BY



A T L A N T A
C H I C A G O
L O N D O N
P R I N C E T O N
W A S H I N G T O N